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New data on the distribution and biology of the invasive species *Hydrotaea aenescens* (Wiedemann, 1830) (Diptera, Muscidae)

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Abstract

Introduced from the New World, *H. aenescens* has spread rapidly in Europe. This paper reports new records of *H. aenescens* from Eastern Europe. Among these records, the one from the far north of European Russia is the most remarkable. New data on the seasonal activity and mating behaviour of *H. aenescens* are also given. A peak of *H. aenescens* imago activity in southern Turkey takes place during very early spring. The mating behaviour of *H. aenescens* differs from that of other members of the genus *Hydrotaea*.

Keywords

Hydrotaea aenescens, Muscidae, invasive species, introduced species, faunistic records, mating behaviour, courtship, phenology, seasonal activity, Russia, Turkey

Introduction

Hydrotaea aenescens is widely distributed in the Neotropical and Nearctic regions, and was introduced into Europe around 1960 (Saccà 1964). Current data on the dispersal of *H. aenescens* in Europe is given in Pont *et al.* (2007).

From my experience, the most attractive substrate for *H. aenescens* is vertebrate carrion. On the same substrate, I usually found *H. aenescens* together with another *Hydrotaea* – our common indigenous *H. ignava* (Harris). Both flies look alike due to their unmodified fore femur and strong metallic shine (previously they were placed in the genus *Ophyra*), and they have obvious synanthropic trends. When caught, *H. aenescens* is unmistakable due to its yellow palpi. In the field *H. aenescens* is slightly

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smaller and has a greenish shine instead of the bluish shine in *H. ignava*. I decided that it would be interesting to compare the behaviour, and especially the courtship and mating strategies, of these two species.

Material and methods

To attract *H. aenescens,* I used vertebrate carcasses (dog, cat) found near roads. These animals had been killed in road accidents and were in various stages of decomposition. Usually I had to move the carcass away from the road to a more suitable place where neither the flies nor I would be disturbed.

Observations took place in Turkey near Antalya and in Russia near Sochi and near Narjan-Mar (Fig. 1), between September 2007 and July 2008.

The collected material is stored in the Zoological Museum of Moscow State University, Russia.

To understand the mating behaviour, I simply used visual observations, and I recorded what I saw using photography (CanonD20 digital camera with Canon 100mm/2.8 macro lens).

Results and discussion

I. Distribution and phenology

Records. Turkey, Antalya, near Side, sand dune with pine trees, 02-04 October 2007, cat carcass.

The only female of *H. aenescens* was collected among 15-20 females of *H. ignava*. No males recorded.

Turkey, Antalya, near Side, sand dune with pine trees, 21-27 February 2008, dog carcass. *H. aenescens* was numerous, with a male/female ratio 2 : 1. *H. ignava* was not recorded at all.

Turkey, Antalya, near Side, Lake Titreyen, 21-27 February 2008, another dog carcass, half-buried under sand. *H. aenescens* was common, with a male/female ratio 2 : 1. *H. ignava* was not recorded at all.

Turkey, Antalya, near Side, Lake Titreyen, 30-31 March 2008, the same dog carcass, half-buried under sand. *H. aenescens* was less common than one month previously, with a male/female ratio about 1 : 1. *H. ignava*, on the contrary, appeared in great numbers, with more males than females. Males of *H. ignava* hovered above carrion at a height of 10-50 cm.

Turkey, Antalya, near Side, sand dune with pine trees, 28-31 May 2008, cat carcass. *H. aenescens* was not recorded, but several specimens of *H. ignava* were collected, all females.

Russia, Sochi region, Black Sea beach near Veseloe, 23-25 October 2007, dog carcass. Only females of *H. aenescens* and *H. ignava* were collected. *H. ignava* was 3-4 times more abundant than *H. aenescens*.

Russia, Nenetsk Nat. Res., 60 km north of Narjan-Mar, 68.15N 53.65E, 9-11 July 2008. Males and females of *H. aenescens* were found in and around a refuse pit for rotten fish waste and kitchen garbage. This refuse pit was near a fishing shack used by fishermen and scientists. The hut was situated at least 50 km away from the nearest inhabited village.

Phenology. It might be thought that *H.aenescens*, being originally a Neotropical species, might be a warmth-loving species. On the contrary, however, in South Turkey it is among the very few Diptera that emerge as early as in February. The high percentage of males and high courtship-mating activity observed in February testify to the fact that these were not overwintering flies but rather a freshly emerged generation.

When it comes to comparing different field observations, there must always be some doubt as to whether the situations are strictly comparable – an observer may suppose the sites and the substrates to be approximately the same, but the flies may not see things in the same way. The dog carcass discovered near Lake Titreyen was placed so as to rule out such a possibility. Because it was half-buried under the sand, decomposition was definitely proceeding more slowly than usual and the carcass remained attractive to carrion visitors for a long time. Observations of this carcass showed that *H. aenescens* appeared one month earlier than *H. ignava*. We could also observe that in hot periods *H. aenescens* became much less common than *H. ignava*.

The larvae of *H. aenescens* are often regarded as potential antagonists of the larvae of *Musca domestica* Linnaeus (Skidmore 1985). I doubt that such antagonism takes place, at least in Southern Turkey. The activity of *M. domestica* occurs chiefly in the hot season, and *H. ignava* seems much more suited to be a *M. domestica* antagonist than *H. aenescens*.

Distribution. Russia is a new record for *H. aenescens*. In the map (Fig.1), the countries from which *H. aenescens* has been recorded (Pont *et al.* 2007) are marked in green. The map shows that the report of *H. aenescens* from the southern part of European Russia was rather predictable. However, the record from the Pechora River delta was unexpected. It is interesting that the most northern previously known locality for *H. aenescens* was southern Norway (Rognes 1982), but there are significant differences between the more gentle Atlantic climate of Norway and the extremely severe conditions of the Russian polar tundra. Under these conditions, most of the temperate Diptera fauna is replaced by a boreal fauna. The cold-resistance of *H. aenescens* discussed above is likely to account for its occurrence in a boreal region. Another consideration is the distinct synanthropic trend in *H. aenescens*. My indoor collection of several specimens of *H. aenescens* in February-March in Turkey supports this possibility, as I have never collected other members of the genus *Hydrotaea* indoors.

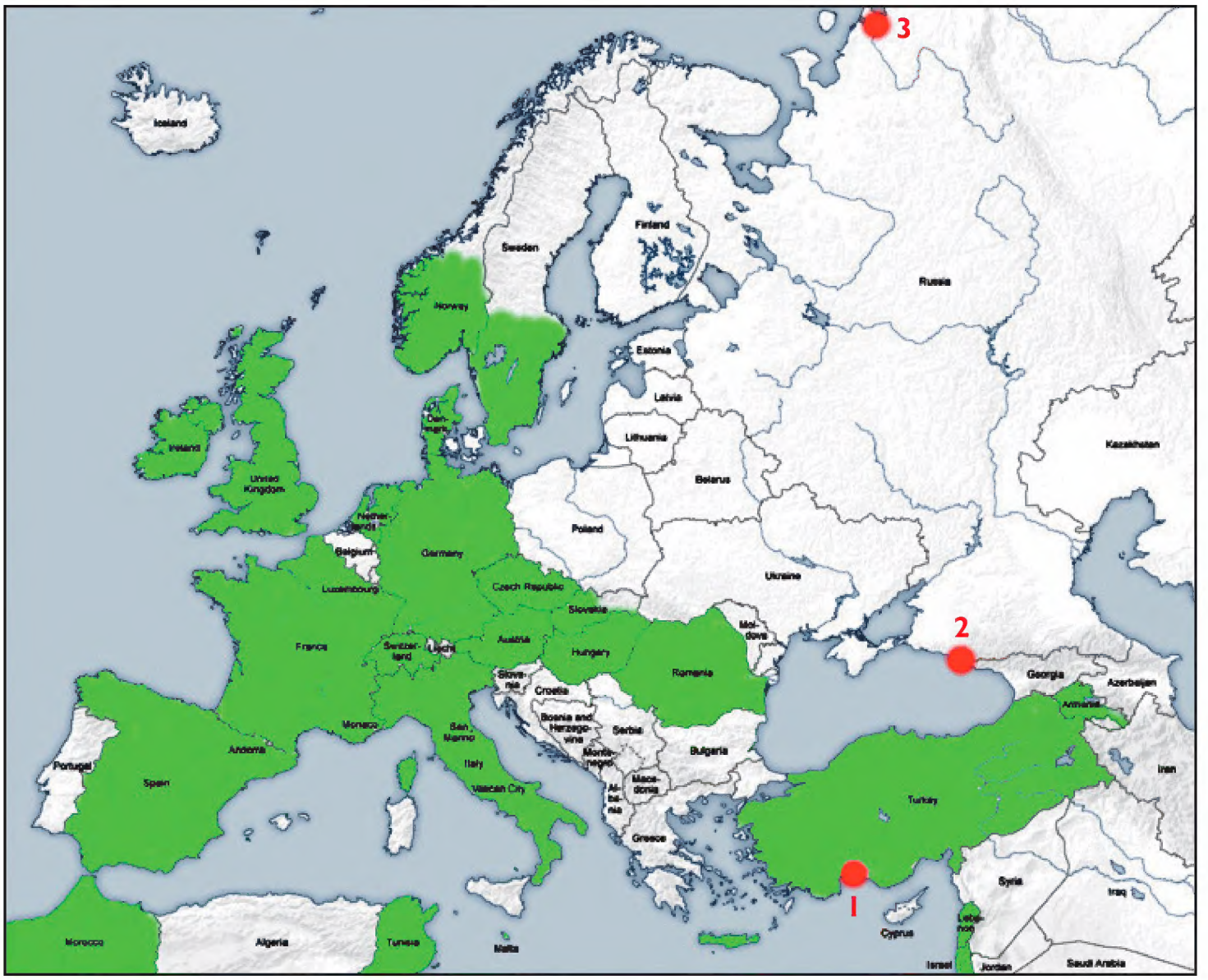

Fig. 1. Map showing the records of *H. aenescens*: 1 – Turkey, Antalya, near Side; 2 – Russia, Sochi region, near Veseloe; 3 – Russia, 60 km North of Narjan-Mar, 68.15N 53.65E. Countries where *H.aenescens* was previously recorded (Pont *et al.* 2007) are marked in green.

II. Mating behaviour

Mating behaviour was observed on the dog carcasses during the period 22-27 February 2008. Males were found sitting on and around carrion, often changing positions but clearly avoiding shaded sites. I would characterize the mating behaviour of *H. aenescens* as follows: trying to copulate with any fly of the same size or bigger (preferred), with a metallic shine, in sunlight. Females spent more time in the shade under the carcass, where it was suitable for oviposition, and were not commonly the object of such courtship, but male-to-male mating attempts were regular and numerous. This behaviour was difficult to record on camera since the male underneath immediately tried to escape or to change his position to the upper one. To make an image of an immobile copulating pair attacked by another male was a much easier task.

Calliphoridae of both sexes also attract *H. aenescens* males. Fig. 3 shows *Lucilia sericata* (Meigen) (large and shining, as *H. aenescens* prefers) and *Calliphora vomitoria* (Linnaeus) (not very shining, but large in size) with *H. aenescens* males.

Fig. 2. Copulating pair of *H. aenescens* attacked by another male.

Fig. 3. Males of *H.aenescens* attempting to copulate with *L.sericata* (left) and *C.vomitoria* (right)

However, the species that suffers the most from this sexual harassment is *Chrysomya albiceps* (Wiedemann). This can be described as a case of 'the biter being bitten himself', because, in their turn, males of *C. albiceps* display the same mating behaviour with male-to-male attempts and the disturbance of copulating pairs by another male(s). The next photograph will illustrate this (Fig.4).

Piophilidae, Sarcophagidae and Fanniidae were totally ignored, probably because they were too small or not shining.

A normal copulation of *H. aenescens* was also observed, although not very often. Copulation was on or around carrion and lasted for 2-6 minutes.

In late March, males of *H. ignava* exhibited a very spectacular hovering behaviour above carrion.

No hovering/swarming by *H. aenescens* was observed during my observations. Furthermore, I am certain that it never happens because swarming is replaced by the mating behaviour described above. To my knowledge, the non-swarming courtship of *H. aenescens* is unique in the genus *Hydrotaea*.

Fig. 4. A copulating pair of *C. albiceps* attacked by males of *H. aenescens* and *C. albiceps* at the same time.

Fig. 5. Copulating pair of *H. aenescens*

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